Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

A CASE OF RAT-BITE FEVER

PLATE 5

RUTH TUNNICLIFF AND KATHERINE M. MAYER

From the John McCormick Institute for Infectious Diseases and the Children's Memorial Hospital, Chicago

A streptothrix—Streptothrix muris-ratti—has been isolated from the blood of 3 patients with rat-bite fever (Schottmüller,[1] Blake,[2] and Litterer[3]) and observed in the fresh blood in a fourth case by Tileston.[4] Similar organisms, culturally and morphologically, have been found in bronchopneumonia of white rats by Tunnicliff.[5] Another streptothrix—Streptothrix putorii—has been isolated by Dick and Tunnicliff[6] from the blood of a patient bitten by a weasel. The clinical picture of this case was similar to that of rat-bite fever, but the streptothrix differed from Streptothrix muris-ratti culturally in growing more profusely and in producing a grayish-yellow color on dextrose-blood agar, and in growing in plain and dextrose broth and in milk. It differed morphologically in not forming long and wavy filaments.

The present case of rat-bite fever, which ended in death, occurred in a colored girl, aged 13 days, who entered the Children's Memorial Hospital, March 11, 1918, in the service of Dr. Parmalee. Nine days before, the patient was bitten by a rat on the face. The upper lip and gum were cut through and the left cheek lacerated. On entrance there was edema of the eyelids; the left cheek and upper lip were covered with small, irregular, not depressed, scarlike areas; the right cheek was red, indurated and firm from the nose to the angle of the mouth and external canthus of the eye, and was apparently painful, the upper lip being deformed. The cervical glands were palpable. The physical examination otherwise negative. Leukocyte count, 32,000, temperature, 101 F.

March 15: Pus discharging from the right nostril. Temperature normal.

March 21: Temperature rose to 101 F.

March 22: Wassermann reaction negative. An eruption has appeared on the chest and abdomen of bluish red, sharply defined macules, about 3 cm. in diameter. They were somewhat obscure on account of the color of the skin.

March 23: Blood culture, negative.

Received for publication July 1, 1918.

---

[1] Dermat. Wchnschr., 1914, 58, Suppl., p. 77.

[2] Jour. Exper. Med., 1916, 23, p. 39.

[3] Jour. Tenn. State Med. Assn., 1917, 10, p. 310.

[4] Jour. Am. Med. Assn., 1916, 66, p. 995.

[5] Jour. Infect. Dis., 1916, 19, p. 767.

[6] Ibid., 1918, 23, p. 183.

March 25: The eruption had faded; hemoglobin, 70%; red blood corpuscles, 4,200,000; leukocytes, 17,000; polymorphonuclear cells, 74%; large lymphocytes, 14%; small lymphocytes, 12%.

March 27: Leukocytes, 18,800.

March 28: Patient died at 4 a. m.

The necropsy 11 hours after death by Dr. R. F. Austin showed general anemia of the viscera; malnutrition; healed bite wounds of left cheek; uric acid infarcts of kidneys.

Section of the tissues were stained by the Gram and also by the Levaditi methods. The heart, spleen and kidney sections showed no changes. The lung showed a little bronchopneumonia, and many small streptococci, large coccobacilli, and a few filaments were present in the lung tissue. The liver showed some hyperemia. There were hemorrhages in the suprarenals. Sections of ganglions near the suprarenals, which were stained by Levaditi's method, showed slight degeneration of the ganglion cells and some cells contained in their nuclei short and long filaments (5-10 mikrons), some being quite wavy; round swellings or attachments were observed on occasional filaments. and one end was at times broader than the other; one filament appeared to branch (Fig. 3). No spirochetes were seen in any of the sections. Great care must be taken in Levaditi sections not to mistake nerve and connective tissue fibers for spirochetes.

Sections were made of ganglions in the region of the suprarenals, stained by Levaditi's method, from 2 adults to determine better whether the filaments seen in the ganglion cells in this case of rat-bite fever are organisms or not. As no such filaments have been observed in the 2 controls and as the filaments correspond closely to those observed in the blood during life and in the cultures, it is possible that they are organisms. If they are organisms their presence in the ganglion cells may have had something to do with the death of the patient, the lesions in the other organs being almost negligible.

Smears from the bone marrow showed streptococci and filaments; stained by Leishman's and Tribondeau's modification of Fontana's silver stain, no spirochetes were found in smears from any of the organs.

Blood smears made March 22 when the eruption was present, but the temperature reduced, showed inside the polymorphonuclear leukocytes, filaments 5-10 mikrons in length. They were fairly straight; one end was often wider than the other; one appeared to branch. About 5 were observed in a blood smear and were best seen in stains with carbol-thionin followed by carbol-gentian-violet (Fig. 1). A few were present outside the cells. They were not seen in smears made the following day. Dark fluid examination of blood drawn March 23 and 27 failed to demonstrate any organisms.

Blood cultures made March 22 were negative; this was 24 hours after the onset of the attack, and at that time the organisms found in smears were largely inside the leukocytes, which may account for the failure of growth.

Cultures from the heart blood at death were made on goat blood-agar plates, ascitic broth and Loeffler's blood serum. After 48 hours' incubation all showed a growth of a streptothrix and large gram-negative coccobacilli, such as seen in the sections of the lung. On the blood-agar plates, which showed about 4-10 colonies of the streptothrix to one of the coccobacillus, the streptothrix grew as minute, dry, grayish colonies, becoming larger and moister on cultivation, while the coccobacillus produced a large grayish moist colony. A streptococcus producing green colonies on blood agar was isolated from the lung.

The streptothrix from the blood of this case is nonmotile, slender, curved and branching (Fig. 2). Branching is not frequent and seen only in cultures about 18 hours old, when the growth is just visible. The organisms vary from 1-10 mikrons in length. The longest forms are seen in early cultures, about 18 hours, the short forms only being present later; the organisms often appear broader at one end than the other and S-shaped forms are seen; ball-shaped swellings are observed especially when the organism branches. A few long and wavy filaments were observed only in the early cultures in ascitic broth. The organism is gram-negative, stains with ordinary stains and is not acid fast. It grows both aerobically and anaerobically, and growth generally occurs in 24-48 hours on blood agar and Loeffler's blood serum as discrete colorless, grayish-white pinpoint, circular, elevated colonies with sharp margins. Later the growth becomes moist and confluent. It does not produce any pigment. The medium is not changed. Growth in ascitic broth is slight but whitish and flocculent, the medium not remaining clear. There is slight growth only in plain and dextrose broth and milk, and on plain agar, dextrose agar and potato. The streptothrix ferments dextrose, raffinose, maltose and leontose, but not salicin, lactose, inulin and mannite. It is killed by exposure to 65 C. for one half hour.

The growth on one blood-agar slant injected intravenously in a rabbit made it ill but did not kill it or produce any special symptoms. No organism could be demonstrated in the blood.

The coccobacillus ferments no sugars and was not virulent for guinea-pigs. The streptococcus from the lung fermented salicin, dextrose, lactose and saccharose and was nonpathogenic for guinea-pigs.

The patient's blood was studied for opsonins and agglutinins for Streptothrix putorii, but none were demonstrated. Further experiments could not be made because of lack of blood. Agglutinins (1:10) for the homologous streptothrix were present in the blood of the rabbit 1 month after inoculation, but not for Streptothrix putorii.

The streptothrix isolated in this case is more closely related culturally and morphologically to Streptothrix putorii than to Streptothrix muris-ratti. Morphologically, it differs from the Streptothrix putorii in being shorter, as a rule. It differs culturally in producing a grayish color rather than a grayish-yellow color on dextrose-blood agar, in growing less abundantly on plain and dextrose agar, and in fermenting dextrose, raffinose, maltose and leontose.

The chief points of interest in this case of rat-bite fever are the presence of a streptothrix in the polymorphonuclear leukocytes during life; in blood cultures after death; in smears of bone marrow, and possibly in the ganglion cells near the suprarenals.

EXPLANATION OF PLATE 5

Fig. 1.—Blood smear made during life; carbol-thionin and carbol-gentian-violet; × 1,000.

Fig. 2.—Twenty-hour-growth in ascitic broth of streptothrix isolated from blood after death. Carbol-gentian-violet, × 1,000.

Fig. 3.—Section through ganglion near suprarenal, Levaditi preparation. × 800.

TABLE 5

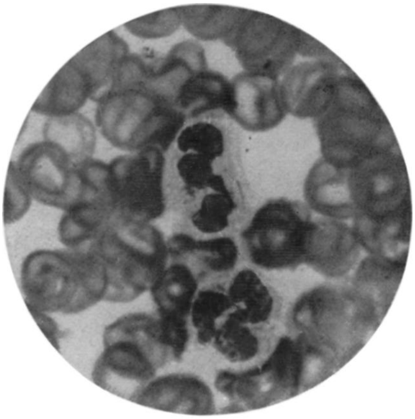

Figure 1

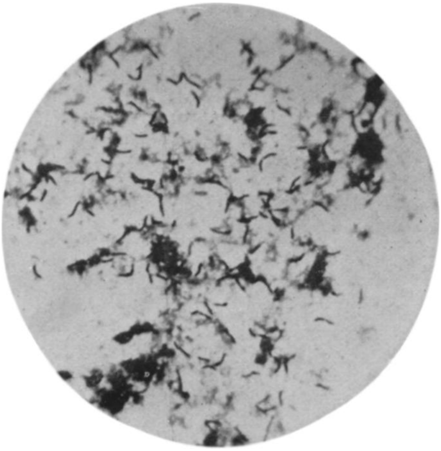

Figure 2

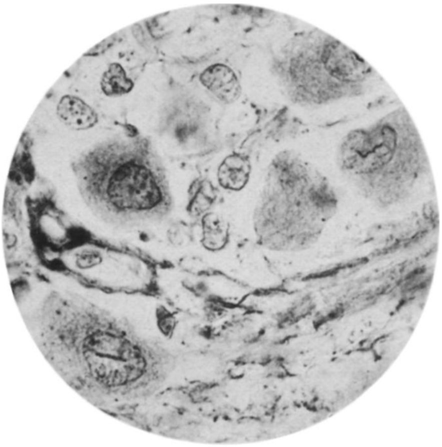

Figure 3